CLAIMS

1. A fuel cell system comprising:

a fuel cell stack including an anode, a cathode, and an electrolyte membrane disposed therebetween;

a fuel supplying unit connected with the anode of the fuel cell stack by a fuel supplying line for supplying hydrogen-including fuel to the anode;

an air supplying unit connected with the cathode of the fuel cell stack by an air supplying line for supplying oxygen-including air to the cathode of the fuel cell stack; and

a heating unit for heating fuel supplied to the fuel cell stack into a proper temperature.

2. The system of claim 1, further comprising a gas/liquid separator for obtaining hydrogen generated from the fuel cell stack after reaction.

3. The system of claim 1, wherein the heating unit is connected to the anode of the fuel cell stack by a hydrogen supplying line and is composed of a hydrogen combustor for heating fuel and air supplied to the fuel cell stack into a proper level by using hydrogen generated from the anode after reaction.

4. The system of claim 3, wherein the hydrogen combustor comprises:

a housing for respectively passing fuel supplied to the anode of the fuel cell stack and air supplied to the cathode;

a blowing fan installed at the housing for blowing external air into the housing; and

a heat generating unit installed in the housing and for heating fuel and air which pass through inside of the housing by generating heat after reaction with hydrogen generated from the anode of the fuel cell stack.

5. The system of claim 4, wherein a fuel pipe through which fuel passes is arranged as a coil form and an air pipe through which air passes is arranged as a coil form in the housing.

6. The system of claim 5, wherein the fuel pipe and the air pipe are separated from each other by a division body.

7. The system of claim 6, wherein the fuel pipe is disposed inside the division body thus to directly receive heat generated from the heat generating unit, and the air pipe is disposed outside the division body thus to indirectly receive heat generated from the heat generating unit.

8. The system of claim 7, wherein one end portion of the fuel

pipe is connected to a fuel inlet and another end portion thereof is connected to a fuel outlet, and the fuel inlet is disposed at an upper side of the housing and the fuel outlet is disposed at a lower side of the housing.

9. The system of claim 7, wherein one end portion of the fuel pipe is connected to a fuel inlet and another end portion thereof is connected to a fuel outlet, and the fuel inlet and the fuel outlet are respectively disposed at an upper side of the housing.

10. The system of claim of claim 4, wherein the blowing fan is rotatably installed at a lower portion of the housing, and exhaustion holes for exhausting air which has finished a heating operation while passing through the housing outwardly are formed at an upper portion of the housing.

11. The system of claim 4, wherein the blowing fan uses electric energy generated from the fuel cell stack as a power source.

12. The system of claim 4, wherein the heat generating unit is provided with catalyst attached to inside thereof and is formed to introduce oxygen-including air blown by the blowing fan thus to generate heat in accordance with that the hydrogen, the oxygen, and the catalyst reciprocally react.

13. The system of claim 12, wherein the catalyst is formed as a honeycomb type, an igniter for igniting is installed at one side of the catalyst, and the heat generating unit is connected to the hydrogen supplying line thus to be provided with hydrogen from the gas/liquid separator.

14. The system of claim 4, wherein the hydrogen combustor is provided with a controller for maintaining temperature of the heated air and fuel as a proper level and thereby supplying to the fuel cell stack.

15. The system of claim 14, wherein the controller comprises:

a temperature sensor installed at one side of the hydrogen combustor for detecting temperature of the hydrogen combustor;

a hydrogen supply amount controller installed at the hydrogen supplying line for controlling a hydrogen amount supplied to the hydrogen combustor; and

a controller for controlling the hydrogen supply amount controller according to a signal applied from the temperature sensor.

16. The system of claim 1, wherein the heating unit is composed of a fuel kit for supplying fuel powder to a fuel tank before operating a fuel cell in order to increase temperature of fuel by using heat generated when fuel powder is mixed with water stored in the fuel tank of the fuel supplying unit.

17. The system of claim 16, wherein the fuel kit comprises:

a container for storing fuel powder; and

an open/close unit installed at an inlet of the container for opening the inlet of the container at the time of supplying the fuel powder to the fuel tank.

18. The system of claim 17, wherein the open/close unit comprises:

a cap body mounted at the inlet of the container and provided with a valve seat therein;

a valve plate contacting the valve seat or separated from the valve seat for performing an open/close operation;

a stopping plate connected with the valve plate for separating the valve plate from the valve seat when the fuel kit is mounted at the fuel tank; and

a spring installed between the stopping plate and a lower surface of the valve seat for providing an elasticity force by which the valve plate is adhered to the valve seat.

19. The system of claim 18, wherein an upper surface of the fuel tank is provided with a fuel supplying unit into which the cap body is inserted and at which the stopping plate is stopped for supplying fuel stored in the fuel

kit into the fuel tank.

20. The system of claim 19, wherein the fuel supplying unit is protruding from the upper surface of the fuel tank as a cylindrical shape, a stopping surface for stopping the stopping plate is formed at an upper surface of the fuel supplying unit, and a supply hole to which fuel powder is supplied is formed at the stopping surface.

21. The system of claim 18, wherein the valve plate is preferably formed as a 'V' shape in order to be easily adhered to the valve seat.

22. The system of claim 18, wherein the stopping plate is provided with a plurality of penetration holes for passing fuel powder at a circumference thereof.

23. The system of claim 18, wherein the spring is preferably a coil spring installed between an upper surface of the stopping plate and a lower surface of the valve seat.

24. The system of claim 17, wherein a blade for well mixing fuel powder with water when fuel powder is supplied into the fuel tank from the fuel kit is installed at one side of the fuel tank.

25. The system of claim 24, wherein the blade is rotatably installed at a lower portion of the fuel tank and connected with a driving motor for generating a driving force by a rotation shaft.

26. The system of claim 17, wherein the fuel powder is mixed powder between NaOH and BH_4.

27. The system of claim 1, wherein the heating unit is composed of a thermoelectric module for heating fuel supplied from a fuel tank of the fuel supplying unit to the anode of the fuel cell stack.

28. The system of claim 27, wherein a heating container contacting the thermoelectric module and for heating fuel by a heat emitting operation of the thermoelectric module is installed at the fuel supplying line.

29. The system of claim 27, wherein a cooling container for cooling fuel and a fuel filter for filtering $NaBO_2$ crystallized in the cooling container are installed at a fuel recycling line for recycling fuel into the fuel tank from the fuel cell stack.

30. The system of claim 29, wherein the cooling container is provided with a low temperature ceramic board of the thermoelectric module thus to be cooled by a heat absorbing operation of the thermoelectric module.

31. The system of claim 29, wherein the fuel filter comprises:

a case mounted at the fuel recycling line which connects the cooling container and the fuel tank; and

a filtering net installed in the case and for filtering crystallized $NaBO_2$.